

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN SEALING RINGS

(71) We, THE DUNLOP COMPANY LIMITED, a British Company of Dunlop House, Ryder Street, St. James's, London, S.W.1., (formerly 1, Albany Street, London N.W.1.), do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to sealing rings which are used as oil seals in association with rotating shafts or other members in machinery to prevent the escape of fluid such as lubricating oil or grease from the machinery and to prevent the entry of foreign matter into the machinery.

15 One form of oil seal comprises an annular lip formed from elastomeric material and is arranged to be mounted between a pair of relatively rotatable members, the seal normally being secured fluid-tightly to one of the relatively rotatable members and arranged so that its lip tends to make rubbing engagement with the other member.

25 One object of the present invention is to provide a sealing ring having improved sealing characteristics.

30 According to the invention, a lip-type sealing ring comprises an annular lip formed from elastomeric material and having an annular sealing area formed thereon, a portion of the lip surface on one side of the sealing area having a series of grooves formed therein, the grooves being of dove-tail cross-sectional shape with a relatively narrow opening and a relatively broad base.

35 One embodiment of the invention will now be described, by way of example with reference to the accompanying drawings in which:—

40 Figure 1 shows a sectioned perspective view of a sealing ring according to the invention; and

45 Figure 2 shows a portion of a sealing area formed on the sealing ring of Figure 1, when

viewed in the radial direction with respect to the ring, illustrating the cross-sectional shape of two of a series of fluid-return grooves formed in the ring.

As shown in the drawings, a lip-type sealing ring 1 comprises an annulus 2 of elastomeric material which is generally U-shaped in cross-section. An annular metal support ring 3 of L-shaped cross-section is bonded to the elastomeric annulus 2, one limb 4 of the L-section support ring serving to support the radially outer limb 5 of the U-section elastomeric annulus.

The sealing ring 1 is arranged to be clamped by the support ring 3 in coaxial relationship with a rotatable shaft (not shown). The radially inner limb 6 of the elastomeric annulus is formed with a lip 7 having on its radially inner surface an annular sealing area 8 for engagement with the shaft.

A groove 9 is formed in the radially outer surface of the lip 7 to house a garter spring 10 which serves to press the lip into engagement with the shaft.

The radially inwardly facing side of the lip 7 has formed thereon a pair of frusto-conical side surfaces 11, 12 which converge radially inwardly to meet the annular sealing area 8 approximately in the central plane of the ring 1. The side surface 11, which is intended to from the axially outer side of the sealing ring when in position around the shaft, is provided with a series of evenly spaced fluid-return grooves 13 of dove-tail cross-sectional shape extending around its whole periphery, each groove extending in a generally axial direction with respect to the ring and terminating in the annular sealing area 8 of the ring.

The dove-tail cross-sectional shape of the grooves 13 has an important effect in that it creates a formation on the outer side surface of the sealing ring 1 which tends to pump back any oil droplets which may escape between the sealing area 8 of the ring and the associated shaft (not shown). The openings

14 formed where the grooves enter the annular sealing area are of trapezium shape and each groove presents in that area a pair of oppositely inclined faces 15, 16 (see Figure 3) on which the emerging droplets of oil will impinge, the droplets encountering one or other of the inclined faces depending on the direction of rotation of the shaft relative to the seal since the droplets will normally move in the same tangential direction as the direction of rotation of the shaft. On striking an inclined face the droplets will tend to be returned towards the sealing area of the lip and thus to be pumped back towards the inner side face 12 of the sealing ring 1.

One disadvantage of known types of sealing rings which incorporate formations on the outer side face for returning oil which has escaped past the sealing area is that such formations may tend to entrain air and to pump air into the film of lubricant between the sealing area of the lip and the associated shaft. When this occurs the meniscus of the lubricant film may be broken and excessive wear of the lip will occur.

The grooves of the sealing ring described above do not tend to entrain air since although air will be carried round with the rotating shaft and will be in a turbulent condition within the grooves, the flow of air will tend to be in a radially outward direction along the grooves rather than inwardly towards the annular sealing areas. There will generally be insufficient pressure developed in an axial direction to cause air to be driven between the sealing area of the lip and the shaft. A further advantage of the sealing ring-described above is that its oil-return pumping action is effective irrespective of the direction of rotation of its associated shaft.

Although the invention has been described

with reference to one embodiment by way of example, it will be understood that this is illustrative only and the invention is by no means restricted thereto.

In particular, although the invention has been described with reference to a sealing ring having a lip extending radially inwardly with respect to the ring the invention is equally applicable to sealing rings having radially outwardly extending lips.

It is reasonably to be expected that those skilled in the art can make numerous revisions and adaptations of the invention, such as that referred to in the last preceding paragraph, and it is intended that such revisions and adaptations shall fall within the scope of the invention.

WHAT WE CLAIM IS:—

1. A lip-type sealing ring comprising an annular lip formed from elastomeric material and having an annular sealing area formed thereon, a portion of the lip surface on one side of the sealing area having a series of grooves formed therein, the grooves being of dove-tail cross-sectional shape with a relatively narrow opening and a relatively broad base.

2. A lip-type sealing ring according to claim 1 having a pair of frusto-conical side surfaces formed one on each side of the annular sealing area, one of the side surfaces having the said series of grooves formed therein.

3. A lip-type sealing ring according to claim 1 or claim 2 wherein the grooves are evenly spaced around the circumference of the lip and extend in generally axial directions.

4. A lip-type sealing ring constructed and arranged substantially as described herein and illustrated in the accompanying drawings.

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